A Guide to the

STARKEY EXPERIMENTAL FOREST AND RANGE

near La Grande, Oregon

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PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION
BLUE MOUNTAIN RESEARCH CENTER, Or.

in cooperotion with

WALLOWA-WHITMAN NATIONAL FOREST,

U. S. DEPARTMENT OF AGRICULTURE
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A GUIDE TO THE STARKEY EXPERIMENTAL FOREST AND RANGE

by

Richard S. Driscoll
Range Conservationist (Research)

The Starkey Experimental Forest and Range is one of eight areas on the national forests of the Pacific Northwest region set apart for research in forest, watershed, and range management. Each of these forested areas is representative of an important forest or range type or types. The Starkey Experimental Forest and Range exemplifies conditions typical of the ponderosa pine type in the Blue Mountains of Oregon and Washington. Here, the Pacific Northwest Forest and Range Experiment Station, in cooperation with the Starkey Cattle and Horse Association, conducts cattle management studies on summer ranges.

PURPOSE

The broad purpose of this experimental area is to develop methods which will promote better grazing management on both public and private lands. More specifically, the objective is to learn basic facts about the forest and range vegetation. With this knowledge, management methods can be developed which will provide maximum production of forage, timber, and water. While serving as a study area, it also demonstrates promising techniques and grazing management practices.

When the research program is fully developed, the area will provide a demonstration of integrated management of forage, timber, wildlife, and water resources. Grazing management research was started in 1940, and watershed management research in 1954. No forest management research is being done at the present time. However, studies of relationships between timber and forage are underway.

LOCATION AND HISTORY OF USE

This research area consists of approximately 27,000 acres on the Wallowa-Whitman National Forest (see map on back cover). It is midway between La Grande and Ukiah in southwestern Union County, and southeastern Umatilla County, Oregon.

The range has been grazed by livestock since the middle of the 19th century. Since 1906, the area has been administered as a grazing allotment by the Forest Service. First records of stocking in 1907 showed 1,313 head of cattle and horses grazing the then 16,000-acre range. The season of use was six months to yearlong. The stocking rate

at that time was approximately two acres per head per month. Since 1907, the stocking rate has been reduced to eight acres per head per month. In 1940, the allotment was set aside for grazing management research. A two-unit, deferred-rotation system of management was begun in 1942. The range is now grazed by 825 head of cattle for four months.

Earliest timber harvest on the area was in 1893. Heaviest cutting has been on the north portion of the range, where all merchantable timber was logged. On the south portion of the range, ponderosa pine was cut on a selection basis. Twenty percent of the original volume was left as a reserve stand. Approximately 3,500 acres, located in scattered tracts, have not been logged.

PHYSICAL AND CLIMATIC CONDITIONS

Most of the Starkey Experimental Forest and Range lies within the Grande Ronde River drainage. Approximately 1,800 acres in the southwest corner drains into the John Day River (fig. 1).

The topography is gentle. No slopes occur of sufficient size or steepness to be a major factor in cattle distribution. The elevation varies from 3,500 feet to 5,000 feet (fig. 2).

The soils of the area are poorly developed. They are derived from basalt or pumicite overlying basalt. Grassland soils are generally shallow, ranging from an inch on the open ridges to more than two feet on better grassland sites. Soil textures vary from a silty clay loam to a heavy clay.

Soils in the timbered areas range from 12 inches to several feet in depth. Soil textures vary from silty clay to clay loam on the more heavily timbered sites to clay loam on the more sparsely timbered sites.

Soils along the principal streams or in depressions are well developed and of alluvial origin. They are dark in color and are deep and fertile.

Average annual precipitation at Starkey headquarters, elevation 4,000 feet, is approximately 19 inches. One-third of the yearly precipitation falls in the form of snow; the remainder falls as rain during the spring and fall months. No month of the year is entirely frost-free.

Many factors are correlated with plant growth. One of the major factors on the Starkey range is the amount and distribution of rainfall during the spring months--April, May, and June. For example, grassland range in poor condition produced 533 pounds of herbage per acre in 1948 when spring precipitation was 9.36 inches. In 1949, when spring precipitation was only 4.32 inches, these grasslands produced only 287 pounds per acre.

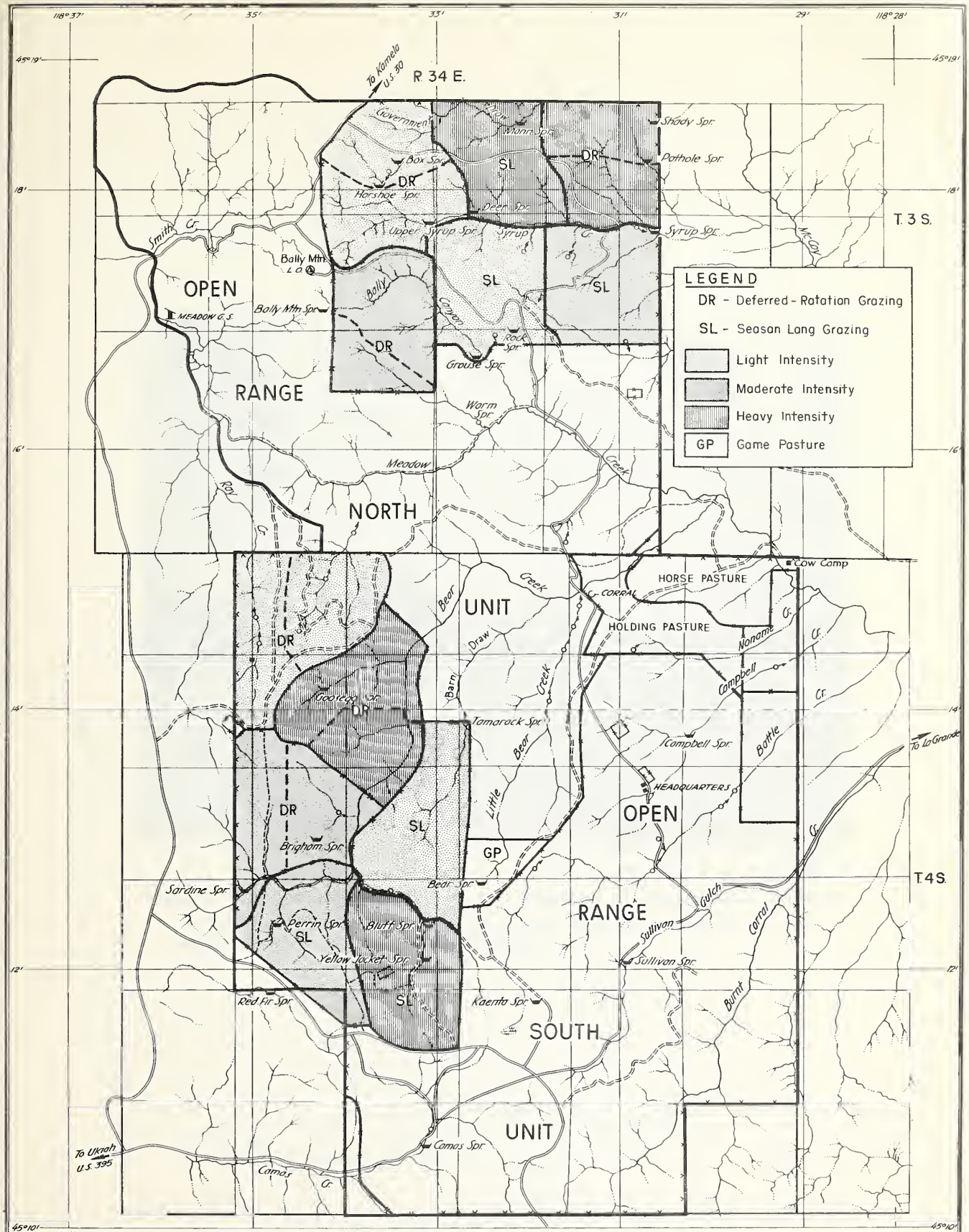

FIGURE 1

STARKEY EXPERIMENTAL FOREST & RANGE

WALLOWA-WHITMAN NATIONAL FOREST

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Figure 2.--The topography on the Starkey is relatively gentle sloping from the rather flat Blue Mountain summit to the upper Grande Ronde River Valley.

This varying production of range forage affects the degree of forage use. In 1948, bluebunch wheatgrass was used only 38 percent when herbage production was high. In 1949, a year of low production, use of bluebunch wheatgrass was 64 percent.

These fluctuations present the rancher with a difficult choice. He must either adjust livestock numbers to the fluctuating forage supply, or stock the range at a conservative level. The latter provides a reserve of forage in all but the extremely dry years. On many ranges, livestock numbers cannot be adjusted annually because of lack of information on range plant responses to weather. Furthermore, annual adjustments of livestock numbers are generally financially undesirable to the rancher. The most practical solution is conservative stocking.

The opening date of grazing at the Starkey is adjusted annually. The range is considered ready for grazing when the soils are firm and when bluebunch wheatgrass seed stalks are showing. Cattle have been turned on the range as early as June 1 and as late as June 23. These fluctuations in range readiness are caused by precipitation and temperatures during the spring months.

When April and May temperatures are warm, the vegetation is usually ready for grazing by early June. If temperatures are cool, development of the vegetation is retarded. Consequently, the range may not be ready for grazing until late June.

In many years, soil firmness is a limiting factor influencing range readiness. Excessive rainfall in late May may saturate the soils. This will delay the opening date, even though the vegetation is ready for grazing. When soils are soft, trampling and compaction damage is severe. In addition, many plants are pulled out of the ground if grazed before soils are firm.

VEGETATION

Range types commonly found on Blue Mountain summer cattle ranges occur in mixture over the Starkey (fig. 3). Twenty-five percent of the area is untimbered grassland containing bunchgrass and dry-meadow range. Fifty percent of the area is open forest range which varies from rather open ponderosa pine (Pinus ponderosa) to a mixture of ponderosa pine, Douglas-fir (Pseudotsuga menziesii), and western larch or tamarack (Larix occidentalis). The remaining 25 percent is dense lodgepole pine (Pinus contorta var. latifolia), Douglas-fir, and grand fir (Abies grandis) areas which have little value as cattle range, but do provide considerable forage for deer and elk.

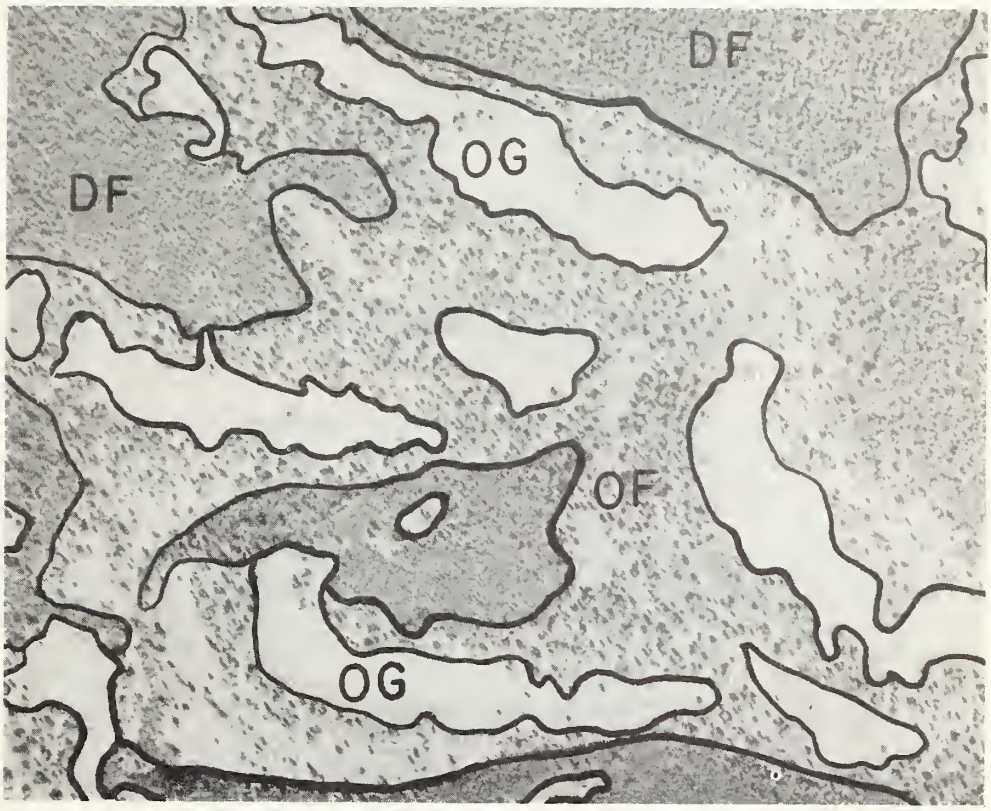

Figure 3.--Aerial photo showing range types:
OG, open grassland
OF, open forest, and
DF, dense forest.

Grassland Range

Grasslands occur as openings interspersed within the timber and vary from a few to more than a hundred acres in size (fig. 4). The major grasses are Sandberg bluegrass (Poa secunda), bluebunch wheatgrass (Agropyron spicatum), Idaho fescue (Festuca idahoensis), prairie junegrass (Koeleria cristata), and onespike danthonia (Danthonia unispicata). The dominant forbs are rush pussytoes (Antennaria luzuloides), western yarrow (Achillea lanulosa), Wyeth eriogonum (Eriogonum heracleoides), and low gumweed (Grindelia nana).

More than 25 grass species are found on the grasslands. However, the five grasses previously mentioned produce 30 percent of the total herbage and provide 46 percent of the forage taken by cattle. Bluebunch wheatgrass produces only 10 percent of the total vegetation, yet furnishes more forage than any other plant--one-fourth of the entire forage grazed.

Forbs produce approximately 40 percent of the total vegetation on the grasslands. Studies in 1941 and 1942 showed that they comprised 27 percent of the total forage taken by cattle.

Although the grassland areas represent only 25 percent of the total area on the Starkey, they produce 40 percent of the total cattle forage. Changes in rate of stocking show up readily on the grassland range. For example, in 1952, bluebunch wheatgrass in one of the experimental pastures received 38 percent use under conservative stocking. In 1953, when the stocking rate was 25 percent higher, utilization of bluebunch wheatgrass was increased to 59 percent.

Open Forest Range

The open forest range varies from the rather open stands of ponderosa pine to the more dense stands of ponderosa pine, Douglas-fir, and western larch (fig. 5). In the more open areas the bunchgrasses, such as bluebunch wheatgrass, Idaho fescue, and prairie junegrass, are common. Under denser, shadier forest, pinegrass (Calamagrostis rubescens) and elk sedge (Carex geyeri) are the dominant grass and grasslike plants. Common forbs are lupines (Lupinus spp.), heartleaf arnica (Arnica cordifolia), wild strawberries (Fragaria spp.), prairie-smoke sieversia (Sieversia ciliata), hawkweeds (Hieracium spp.), and western yarrow. Shrubs found under the more open pine stands are common snowberry (Symphoricarpos albus), wild roses (Rosa spp.), and shinyleaf spirea (Spiraea lucida). Under shadier conditions, big whortleberry (Vaccinium membranaceum) and grouse whortleberry (V. scoparium) dominate the shrub vegetation.

The most important forage species are the grasslike plants and grasses. They provide 65 percent of the forage grazed by cattle. Elk sedge, an evergreen plant, provides more forage than any other species, although pinegrass is the highest herbage producer. Pinegrass, a shade-loving species, is not as palatable for cattle as elk sedge.

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Figure 4.--Grasslands constitute only one-fourth of the Starkey area, but they produce forty percent of its forage.

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Figure 5.--Typical open forest range. Sixty percent of the forage for cattle is obtained from this range.

Forbs produce approximately 42 percent of the total vegetation. They comprise 26 percent of the total forage taken by cattle. The most important forage species are the hawkweeds.

Use of the timbered range varies according to weather and condition of forage species on grassland range. In some years, cattle graze the area early in the season, and very little thereafter. In other years, it is not used until late in the grazing season. Still another pattern of use was observed in 1954. Cattle did not use this range until the grassland species began to dry in mid-July. Regrowth on the grasslands, as a result of August rains, brought the cattle out of the timber to graze the greener feed in the openings. The timber feed received little use after September 1.

PROBLEMS

Summer ranges in eastern Oregon and southeastern Washington do not provide enough forage for all the range livestock that can be maintained on spring-fall ranges and on agricultural lands. This shortage of summer range has resulted in heavy use of the range vegetation, accompanied by lowered forage production and soil losses. Poor distribution of livestock has been a major contributing factor to the deterioration of the range. Grasslands and meadows have been overgrazed, while timbered ranges received little or no use.

Forage on these ranges has been harvested annually for many decades without adequate knowledge of management practices necessary to maintain or increase the forage yield. On ponderosa pine ranges, standards for judging range condition are urgently needed. These standards must be on a firm ecological basis. This requires information on the ecology and physiology of individual range plants, site classification, and methods for measuring their reaction to grazing treatment.

Other important values of these ranges are production of water, big game, timber, and recreation. Watershed values of these lands are becoming increasingly important. They are the principal source of water for irrigation, power, domestic use, and processing of agricultural and timber crops. The relationships between grazing and watershed values are complex. Information is needed for the proper management of ponderosa pine ranges that provide water and livestock forage.

The demand for forage by big game on summer ranges is estimated at 29 percent of the grazing capacity for livestock. Overgrazing and deterioration will occur unless game demands for forage are taken into account when managing ranges for livestock and big game. Efficient management of summer ranges requires information on the nature and extent of competition between big game and livestock.

RESEARCH PROGRAM

Management and Improvement of Ponderosa Pine Ranges

Distribution of Use

Results of studies at the Starkey emphasize that management of summer ranges should be based largely on the grasslands. Records of utilization since 1940 show that the grasslands are grazed much more heavily than adjacent timbered range. Consequently, efficient use of summer ranges is largely dependent upon securing proper distribution of use over all range types. Methods which have been used at the Starkey in an attempt to get better distribution of cattle are: (1) salting; (2) water development; (3) proper placement of fences; and (4) adequate range riding.

An adequate number of properly located salt grounds at the Starkey has provided an economical method of controlling distribution of cattle. Temporary, low-cost salt grounds have been established by using a sound stump, an 8-inch spike, and the hole in the salt block (fig. 6). In 1947, there were 26 salt grounds on the range. By 1954, this number had been increased to 58, or approximately one salt ground for every 460 acres. Salt is moved progressively throughout the season to draw cattle into areas of unused forage or to distract them from areas that have received sufficient use.

Development of small springs--and in some cases seeps or underground water--has changed the Starkey from a poorly watered to a well watered range. This was accomplished by low-cost construction of numerous, strategically located stock ponds (fig. 7). The distribution of cattle is materially improved and more uniform use is being made of all the forage.

Small stock ponds which supply a few head of stock with water for a 2- or 3-month period help relieve areas of livestock concentration. These ponds attract cattle to areas which formerly received little or no use. In 1947, there were 12 water developments on the Starkey range. By 1952, this number had been increased to 50. The development of additional watering places permits the distribution of small groups of cattle to many places, rather than large groups in areas of limited grazing capacity.

The location of fences on the Starkey has played an important role in getting proper distribution of cattle. Concentrations of cattle along fence lines were reduced by locating fences on or near ridge tops (fig. 8). Natural use of drainages by cattle was obtained by fencing the drainage boundaries rather than across them. Maintenance costs of fences were reduced by placing them on ridge tops.

Experiences at Starkey have shown that range riding is essential for getting good distribution of cattle. The size of range unit that

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Figure 6.-- A "mobile" salt ground which can be easily established, maintained, and abandoned with a minimum of expense.

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Figure 7.--Small stock pond near a ridge top. This pond was constructed by a bulldozer in 20 minutes.

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Figure 8.--Rock-jack, figure-four fence on a ridge top.

one man can cover effectively is approximately 15,000 acres. By having a relatively small unit, the range rider can prevent cattle from concentrating in an area (fig. 9). He is able to examine the range more thoroughly and move cattle into areas of more available forage. One of the advantages of a deferred system of grazing is the reduction of the area which a rider has to cover.

A good range rider knows the country and the way cattle naturally tend to use it. He has a wealth of background information essential for getting proper distribution of use. He knows if there is enough feed in an area to warrant the development of a small spring. He knows if the establishment of a salt ground would be just as effective for getting better distribution. The success or failure of making the best use of a range unit depends almost entirely upon a competent range rider.

Grazing Management Study

The objectives of this study are to compare the effectiveness of different grazing systems and stocking rates for securing maximum production of forage and beef. The response of the range vegetation to these treatments will be studied to develop standards for judging range condition.

Two grazing systems are being compared. One is a season-long system in which the cattle are allowed to graze unmolested for the entire grazing season. The other is a two-unit, deferred-rotation system. Under this system, one unit is deferred during the first half of the grazing season in alternate years. After midseason, the cattle are moved to the second unit.

Three stocking rates are applied under each grazing system. The rates are: light, 10 acres per cow and calf per month; moderate, 7.5 acres; and heavy, 5 acres.

Hereford cows with calves furnished by Cunha Brothers of Echo, Oregon, are grazed each year on 12 experimental pastures. These pastures vary in size from 600 to 900 acres and have approximately equal grazing capacities. Six of the pastures are grazed season-long. The remaining pastures are grazed under the deferred-rotation sytem. The three stocking rates are applied under each grazing system.

Within each pasture, records of herbage production, floristic composition, forage utilization, ground cover, tree reproduction, and game use are collected (fig. 10). In addition, initial and final weights of cows and calves are obtained each year (fig. 11). The effectiveness of the different grazing systems and rates of stocking will be judged by changes in these factors.

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Figure 9.--The range rider and his partners moving a group of cattle from a sufficiently used portion of range.

477751

Figure 10.--Sample plots in the open forest type used for measuring changes in vegetation.

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Figure 11.--Separating cattle at the corrals in preparation for ear tagging and marking for distribution into the experimental pastures. Cows average 975 pounds; calves, 240 pounds.

This study will provide a practical demonstration of two systems of grazing and three rates of stocking on ponderosa pine ranges. The intensive vegetation studies provide information needed for recognizing range condition and trend. Information on cattle distribution is obtained by comparing intensity and period of use on each range type under season-long and deferred-rotation systems of management.

Range Plant Investigations

More uniform use between grassland and open forest range on the Starkey has increased the use of the major forage species in the open forest range. It is necessary to know how this increased use affects these forage plants.

A study is underway to determine the effects of three intensities of herbage removal and four dates of harvest on herbage production of elk sedge. Intensities of herbage removal being tested are 20, 40, and 60 percent. The initial harvest during any one year corresponds to the opening of the grazing season. Remaining harvest periods are at regular intervals until the close of the 120-day grazing season. Results of this study will provide basic knowledge of how elk sedge reacts to intensity and season of use.

Range Relationships

Big Game-Livestock

Two pastures, each approximately 100 acres in size, are being used to study the degree of use and forage preference of deer and elk. These pastures are grazed by big game only. The amount of forage use on individual plants is recorded each spring and fall. In addition, pellet groups are counted to determine the number of days of big game use.

Similar pellet group counts are made in the pastures used by big game and cattle. The amount of forage use by big game in these pastures is determined by the relationship of forage use by deer and elk in the game pastures to the use by both cattle and game.

Range Watershed

A study to evaluate the effects of grazing systems and rates of stocking on soil erosion was initiated in 1954. When the experimental pastures were fenced, each was laid out so it contained a small watershed suitable for combined range-watershed studies (fig. 1). Sediment catchment basins were constructed in six of the experimental pastures and one of the game pastures. Accumulated silt is measured volumetrically by mapping successive yearly profiles of the basins. These measurements show the effect of varying degrees of grazing use on the amount of erosion from grassland and forested range.

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Figure 12.--Elk sedge before harvest.

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Figure 13.--Same plant showing 40 percent herbage removed.

RECREATION AND OTHER USES

Big-game hunting (fig. 14) is the principal recreational use on the Starkey Experimental Forest and Range. Fishing is of minor importance except for the early weeks of the season. Mountain trout fishing is fair in the major streams until the water recedes and becomes warm early in July.

Many weekend visitors are attracted to the Starkey for camping trips or picnics. A fair-weather road is located along the crest of the Blue Mountains, a short distance west of the experimental area. A drive along this road offers the visitor a scenic trip.

Many technicians of range management and allied fields and ranchers visit the area. For many of these visitors, it means seeing field research work for the first time. They often learn of practices which apply directly to their home conditions.

ADMINISTRATION

The Starkey Experimental Forest and Range is administered jointly by the Wallowa-Whitman National Forest and the Pacific Northwest Forest and Range Experiment Station. The forest issues grazing permits and special-use permits for other such uses as may be approved by the station. The forest protects the area from fire and other trespass, and supervises the construction and maintenance of roads. Major adjustments in rate of stocking and season of use are made after mutual agreement has been reached between the forest and the experiment station. The station has the responsibility of initiating and supervising all experimental work carried out on the experimental forest and range.

475796

Figure 14.--The end of a successful morning.

RESEARCH CENTER PUBLICATIONS ON PONDEROSA PINE RANGE MANAGEMENT

1942. Reid, Elbert H. Important plants on national forest ranges of eastern Oregon and eastern Washington. Pacific Northwest Forest and Range Experiment Station, Range Research Report No. 1, 64 p. May 1942.

1942. Reid, Elbert H., and Pickford, G. D., and Nelson, N. T. An appraisal of range survey methods from the standpoint of effective range management. Pacific Northwest Forest and Range Experiment Station, Range Research Report No. 2, 66 p. June 1942.

1948. Pickford, G. D., and Reid, Elbert H. Forage utilization on summer cattle ranges in eastern Oregon. U. S. Dept. of Agric. Cir. 796, 27 p. Sept. 1948.

*1949. Garrison, George A. Uses and modifications for the "moosehorn" crown closure estimator. Jour. Forestry 47 (9): 733-735. Sept. 1949.

1950. Harris, Robert W. Observations on the Starkey Experimental Forest and Range. U. S. Forest Service, Region 6, Range Management Hint No. 1, 6 p. Nov. 1950.

1951. Harris, Robert W. Use of aerial photographs and sub-sampling in range inventories. Jour. Range Mgmt. 4(4): 270-278. July 1951.

1951. Harris, Robert W. In salt blocks--use the holes. Idaho Farmer 69(15): 6; Oregon Farmer 74(15): 6-7; Washington Farmer 76(15): 6. August 2, 1951.

1951. Moore, A. W., and Reid, Elbert H. The Dalles pocket gopher and its influence on forage production of Oregon mountain meadows. U. S. Dept. Agric. Cir. 884, 36 p. August 1951.

*1951. Garrison, George A., and Rummell, Robert S. First-year effects of logging on ponderosa pine forest range lands of Oregon and Washington. Jour. Forestry 49(10): 708-713. Oct. 1951.

*1953. Garrison, George A. Annual fluctuation in production of some eastern Oregon and Washington shrubs. Jour. Range Mgmt. 6(2): 117-121. March 1953.

1953. Driscoll, Richard S. Use plastic to protect aerial photographs. Jour. Range Mgmt. 6(3): 181-2. May 1953.

*1953. Garrison, George A. Effects of clipping on some range shrubs. Jour. Range Mgmt. 6(5): 309-317. Sept. 1953.

*1953. Harris, Robert W. Quicker, easier way to make trough shown. Oregon Cattleman 1(12):8-9. April 1953.

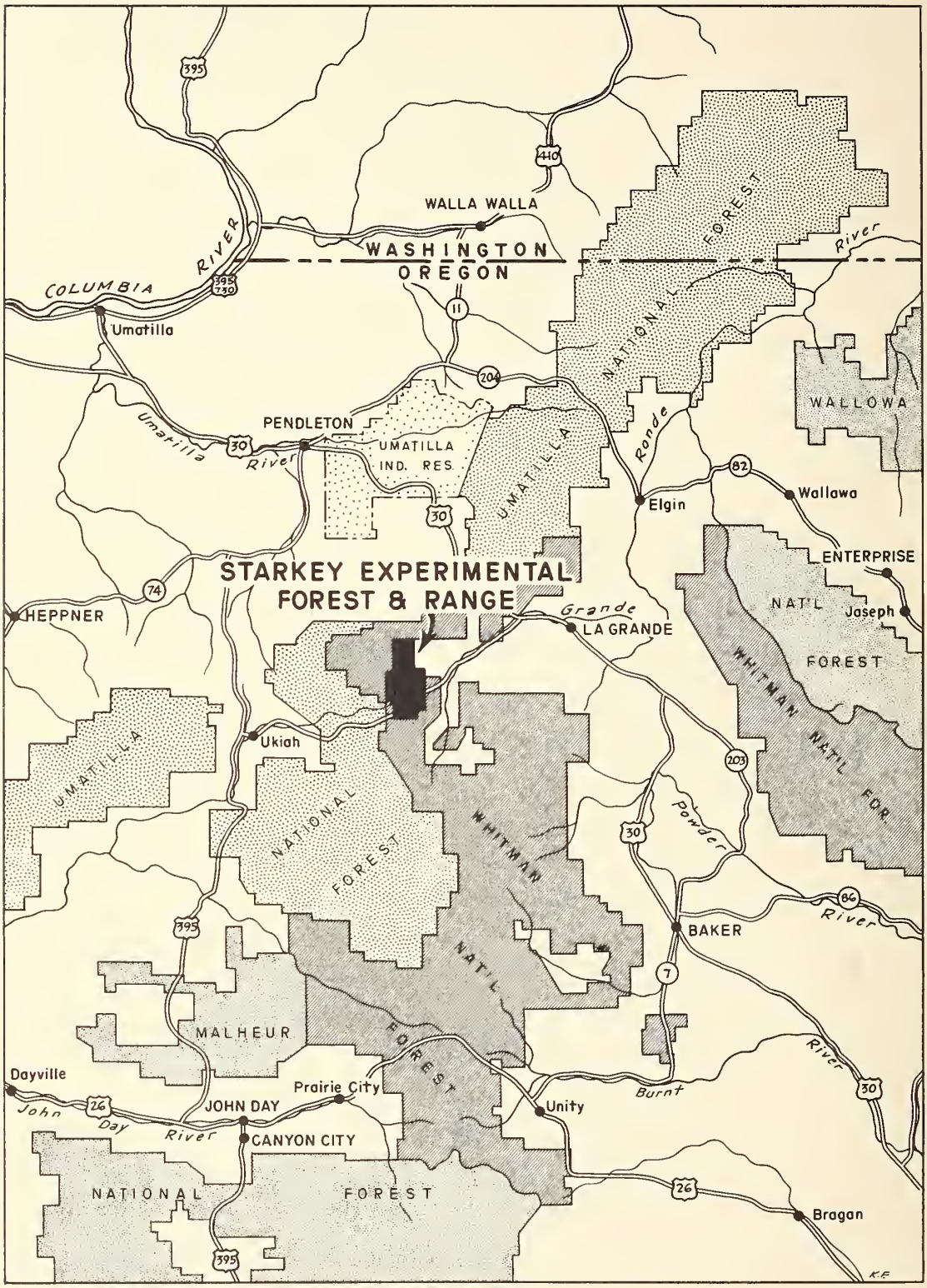
*Not available for distribution.

1954. Harris, Robert W. Small stock ponds--a practical aid for range livestock distribution. Oregon Cattleman 3(3): 7, 20. July 1954.

1954. Harris, Robert W., and Driscoll, Richard S. Gains made by cattle on summer range. Oregon Cattleman 3(5): 5, 24. Sept. 1954.

1954. Harris, Robert W. Fluctuations in forage utilization on ponderosa pine ranges in eastern Oregon. Jour. Range Mgmt. 7(6): 250-255. Nov. 1954.

*Not available for distribution.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FOREST & RANGE
WASHINGTON
OREGON
WALLA WALLA
COLUMBIA
RIVER
Umatilla
PENDLETON
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IND. RES.
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WALLOWA
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Joseph
FOREST
WHITMAN NAT'L FOR
HEPPNER
LA GRANDE
Ukiah
UMATILLA
NATIONAL
FOREST
WHITMAN
NAT'L
FOREST
Powder
River
BAKER
MALHEUR
Dayville
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JOHN DAY
John
Day
River
CANYON CITY
Unity
Burnt
River
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